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Multiple DGT Electronic Boards In a Tournament Situation

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Chapter 1 Overview

The DGT Electronic Chess board has special communication features to ease the use of the board at tournaments. The boards can be connected in a network which has the following advantages:

- Easy to install
- Flexible cable routing
- High degree of data integrity
- Simple adaptation or replacement of cable segments and connection points
- Minimal cabling overhead
- Sufficient scanning and processing speed for all chess applications

A typical networking for a tournament would have the following structure:

The chess boards are divided into groups, where each group can be placed in a relatively small area. Every group of boards is controlled by one data processing computer, having one or more serial COM ports. The maximum amount of boards that can be connected to such data processing computer is depending on the amount of COM ports on the computer: 12 boards can be connected to each COM port. These computers, on their turn, are connected by a local area network. On this local area network, one or more powerful computers are added that have the function of ordering the retrieved game data, restructure them, and further processing for broadcasting or archiving.

This document describes the networking from the chess boards up to the serial port of the data processing computer. The description of software, computers and LAN should be obtained by the developers of the used tournament software. Suitable tournament software is TOMA, developed by DGT Projects. For detailed description of the TOMA software visit <http://www.dgtprojects.com>.

Chapter 2 Network structure and limits

The networking structure is optimized for normal tournament situations. The network topology is described below, starting from the highest level of data gathering, down to the separate chess boards and clocks.

The TOMA network structure.

The boards must be connected to one or more computers in a network, where each computer runs an instance of TOMA. TOMA can process the information of up to 96 boards, which are connected to up to 8 serial (COM) ports.

These computers can be part of a local area network which contains i.e. display computers too.

Group size

Basically the chess boards are connected to serial ports of the TOMA computer. On every single serial port of this computer up to 12 chess boards can be connected.

The amount of chess boards that can be controlled by TOMA depends on some aspects:

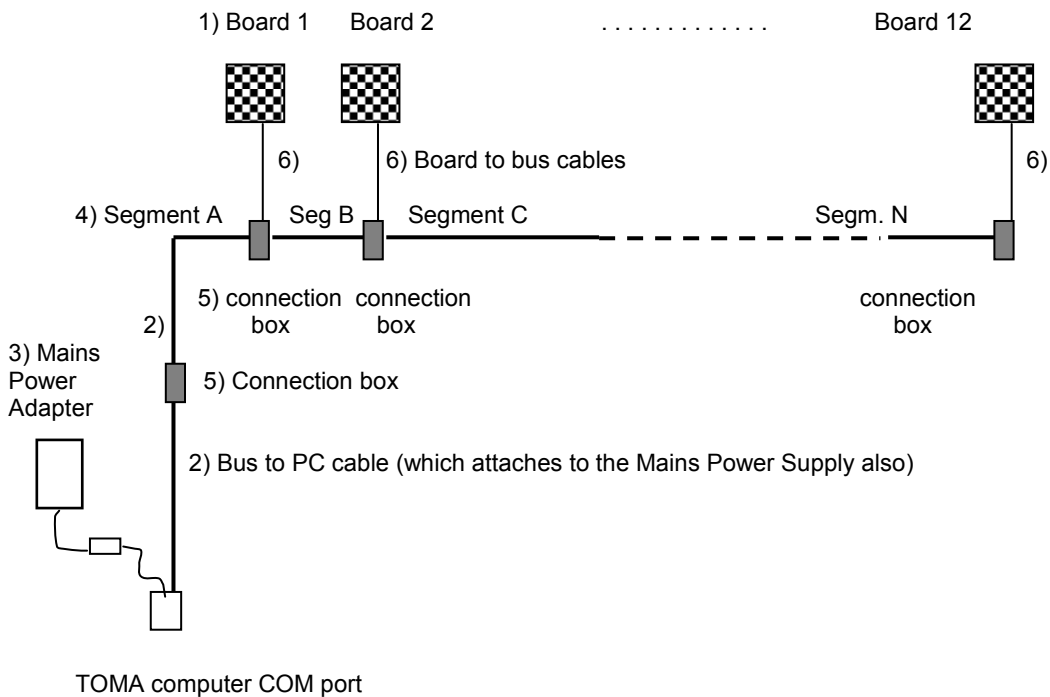
1. The amount of serial ports on the TOMA computer. As said up to 12 boards can be connected to one serial port.
2. The execution speed of the TOMA computer. For the moment, using a 200 MHz Pentium PC up to 48 boards can be processed while communicating every second with every board. Provided higher speed computers, more serial ports could be installed in the PC for controlling more buses of 12 boards.

3. The area over which the chess boards are spread out: The total length of cable used to connect a board to the TOMA computer may not exceed 50 meters. See also the next paragraph.
4. The purchased license including the allowed amount of boards for use of TOMA.

The bus structure

Bus

Every serial port of the XB computer or the TOMA computer is a so called *bus* of boards. The bus is basically a two-directional data transport structure with power lines for the boards. The boards of the bus (up to 12) are attached on this bus. A separate unit, placed at the computer table, provides power for the chess boards. This power is distributed to the boards using the same bus structure.



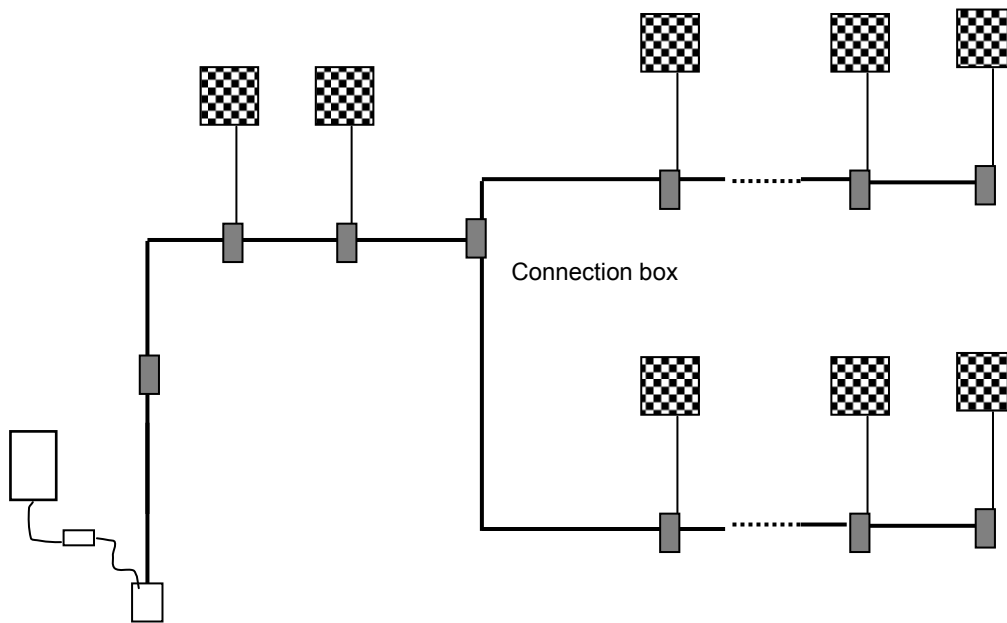
Drawing 1: Single branch

The bus is powered by 100-240 Volt 50/60 Hz AC mains power adapter. DC power is distributed by means of a stabilizing 11.5V DC (1000 mA) mains adapter. The bus is connected to a PC COM port by means of a bus-to-PC cable 2). Also the mains adapter is connected to this cable.

The bus-to-PC cable connects to the bus by means of a connection box 5). From this connection box, a segment cable 4) leads to the first board connection box. This is basically a splitting point in the bus structure and provides for a connector to attach a board 1) to the bus. At this connection box, a board-to-bus cable 6) connects the board to the bus, and the connection box leaves a socket for the second segment cable (marked Seg B in the drawing). This second segment cable leads to a new connection box, where a second board is connected to the bus (The board-to-bus cable provides for attaching a DGT TopMatch Chess Clock, to be placed next to the chess board).

Up to 12 boards can be connected to the bus, by using 12 connection boxes, 12 board-to-bus cables and 12 segment cables

The connection box can also be used to split the bus. This is done by connecting a segment cable at the position where the board-to-bus cable would be connected. (see drawing 2)



Drawing 2: Multiple branches

This bus splitting can be repeated on the new secondary branches. Note however, that the number of connection boxes between any board and the branch power unit may not exceed 15.

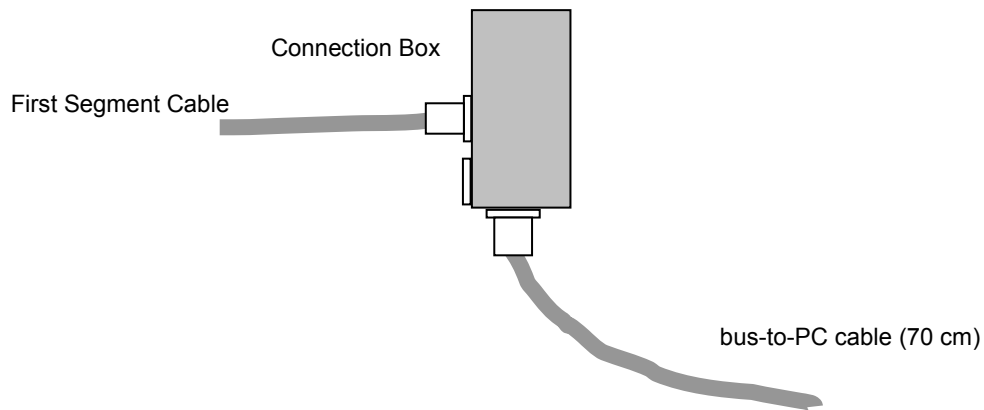
Limits

The total length of segment cable between any board and the bus power unit may not exceed 50 meters. The total length of segment cable attached to one bus power unit, being part of the same branch may not exceed 75 meters. The length of the board-to-bus cable is approx. 90 cm.

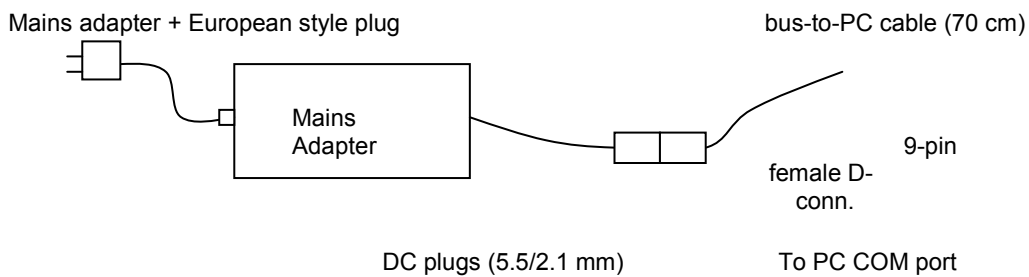
Chapter 3 Description of materials

The following components are needed for installing a network of DGT chess boards:

1. DGT Electronic Chess Boards. Each board in a tournament must have a different serial number. The manufacturer will take care of this at the production. In case of doubts the serial number can be checked by the board test program QUEEN.
The software version of the attached chess board should be 1.01 or higher. This software version can also be checked with the above mentioned test program.
2. Bus to PC cable. This (approx. 75 cm) cable connects to a 9-pin PC COM-port, and to a regular connection box of the bus. Also a cable to the mains adapter splits off the Bus-to-pc cable.



Drawing 3: First connection box

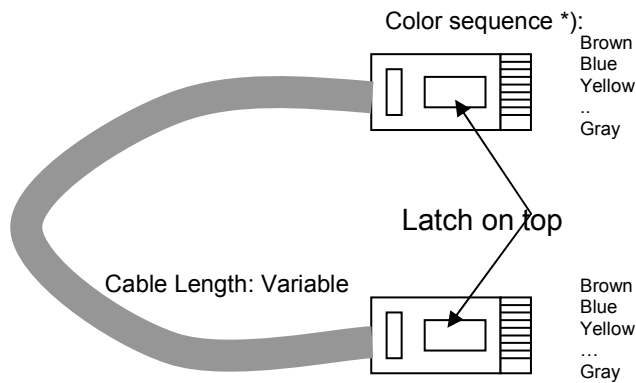


Drawing 4: Branch Power Unit

From all of these parts, one is needed for every branch cq. COM-port.

3. Mains Adapter. Provided is a 100 to 240V AC 50/60 Hz, switching adapter with 11.5 V DC outlet (2.1/5.5 mm DC plug). The adapter is standard delivered with EURO style case connector and a cable to European mains plug.
4. The segment cables are designed for easy reproduction. The cables might be made on specific length for every tournament. A segment cable is made by means of RJ45 Modular Jack connectors and a length of 8 conductor modular cable. For making of the cables, a RJ45 hand tool is needed.
Both ends of the cable should have identical placement of the connector.
 No twisting is allowed.

The number of needed segment cables is at least equal with the number of boards.



*) Color coding of cable can variate

Drawing 4: Segment Cable

5. Connection Boxes.
For every board and for every dividing of a branch into two sub branches a connection box is needed. A connection box might also be used for joining two segment cables into a longer one. In that case, please note the *limits* paragraph.
(NB: Although the printing on the box suggests a special use of every connector, all three connectors in the box are technically equal and may be swapped)
6. Board-to-bus Cables. Every board must be connected to a connection box, using the Board-to-Bus cable. The length of this cable is approx. 70 cm and the cable provides for attachment of a DGT TopMatch clock.
7. Construction material. The connection boxes and used segment cables should be attached to the floor or the used tables. For this, double and single side adhesive tape or *buddies* can be used. These materials are not included with shipments from DGT Project.

Chapter 4 Practical situations

As a preparation for installing networks of boards, the floor plan with chess tables drawn in should be obtained, i.e. from the arbiter of the tournament. Then a cable plan can be made, taking in account the following aspects:

- Avoid that many people have to cross any cable
- Make groups of tables, that can easily connected with short segment cables
- Avoid that the chess players will be hindered by cables, i.e. at their feet, or in sight
- Try to keep the possibilities to replace segment cables or connection boxes, in case of bad connection or disrupted connectors.
- Place connection boxes in a way that no mechanical stress is applied to the connectors of the cables
- Keep in mind that the TOMA computers needs a power socket and a connection to the local area network

Chapter 5 Problems and solutions with the connection network

The following errors might occur:

- A segment cable is constructed wrongly: One of the two ends have an opposite color sequence. Also, a bad connection might have occurred at pressing the connectors, or a cable might be corrupted.
- A connector of a segment cable is badly attached: one or more of the conductors make no connection, or a short-circuit occurs. Find the location by attaching the segment cables one by one, until the error is found.
- The connection between a segment cable and a connection box is bad: Due to dirt or oxidation no connection is made on one or more contact points. Plug and unplug several times to remove the dirt
- The adapter does not deliver the right voltage, or the right polarity. The adapter might collapse only with a certain number of boards connected. Replace the adapter.
- The bus-to-PC cable is defected. Replace it.

A general diagnose-and-cure manual is not given. Try to locate the erroneous component, by removing segment after segment, starting at the end of a branch, or by adding segment after segment, starting at the beginning of the bus.

Chapter 6 Problems and solutions with the boards

After installing the network between the boards and the TOMA computer(s), the TOMA program(s) can be started, during which it reports the board numbers that are found on the network. When not all connected boards are reported, the search for the cause can start, for which the notes of chapter 5 can be useful.

It needs also to be inspected whether all boards function properly. The problems that might occur are:

- Bad board-to-bus cable. Check and replace
- The board electronics does not communicate anymore. The board should be replaced

The final check is on the sensory process: put the chess sets in a starting position and check the report of the TOMA computer. Sometimes one pawn might not be seen: Swap some pawns in the row of black or white.

In the practical situation, it occurs quite often that in the starting position the kings and queens are swapped, or knights and bishops. Pay special attention on that.

